What is claimed is:

1. A method for transmitting high-frequency signals in an optical communication system, the method comprising the steps of:

combining an optical signal, a first optical local component from a local light source and a second optical local component from the local light source having a predetermined frequency differential from the first optical local component;

selecting a first high-frequency signal which consists of two predetermined electrical components from plural electrical components obtained by an optical frequency mixing process; and

mixing the two selected electrical components included in the first high-frequency signal.

2. A method for transmitting high-frequency signals in an optical communication system, the method comprising the steps of:

transmitting an optical signal that includes an optical carrier component and an optical sideband component obtained by modulation with a high-frequency signal whose frequency is predetermined;

combining the optical signal, a first optical local component from a local light source and a second optical local component from the local light source having a predetermined frequency differential from the first optical local component;

selecting a first high-frequency signal which consists of two predetermined electrical components from plural electrical components obtained by an optical frequency mixing process; and

selecting a second high-frequency signal whose frequency is lower by an amount of predetermined frequency differential than a carrier frequency of the first high-frequency signal obtained by the optical frequency mixing process.

3. A method for transmitting high-frequency signals in an optical communication system, the method comprising the steps of:

transmitting an optical signal that includes an optical carrier component and an optical sideband component obtained by modulation with a high-frequency signal whose frequency is predetermined;

extracting an original high-frequency signal from the transmitted optical signal;

combining the optical signal, a first optical local component from a local light source and a second optical local component from the local light source having a predetermined frequency differential from the first optical local component;

making a carrier frequency of the extracted original high-frequency signal coincide with the predetermined frequency differential; and

selecting two predetermined electrical components from plural electrical components obtained by an optical frequency mixing process.

4. A method for transmitting high-frequency signals in an optical communication system, the method comprising the steps of:

transmitting an optical signal that includes an optical carrier component and an optical sideband component obtained by modulation with a high-frequency signal whose frequency is predetermined;

combining the optical signal, a first optical local component from a local light source and a second optical local component from the local light source having a predetermined frequency differential from the first optical local component;

selecting, as a first optical signal, lights containing the optical sideband component included in the optical signal and the first optical local component from the local light source;

selecting, as a second optical signal, lights containing the optical carrier component included in the optical signal and the second optical local component from the local light source; and

selecting a signal with a relatively low frequency after mixing the first and second optical signals.

5. An apparatus for transmitting high-frequency signals in an optical communication system, the apparatus comprising:

means for combining an optical signal, a first optical local component from a local light source and a second optical local component from the local light source having a predetermined frequency differential from the first optical local component;

means for selecting a first high-frequency signal which consists of two predetermined electrical components from plural electrical components obtained by an optical frequency mixing process; and

means for mixing the two selected electrical components included in the first high-frequency signal.

6. An apparatus for transmitting high-frequency signals in an optical communication system, the apparatus comprising:

means for transmitting an optical signal that includes an optical carrier component and an optical sideband component obtained by modulation with a high-frequency signal whose frequency is predetermined;

means for combining the optical signal, a first optical local component from a local light source and a second optical local component from the local light source having a predetermined frequency differential from the first optical local component;

means for selecting a first high-frequency signal which

consists of two predetermined electrical components from plural electrical components obtained by an optical frequency mixing process; and

means for selecting a second high-frequency signal whose frequency is lower by an amount of predetermined frequency differential than a carrier frequency of the first high-frequency signal obtained by the optical frequency mixing process.

7. An apparatus for transmitting high-frequency signals in an optical communication system, the apparatus comprising:

means for transmitting an optical signal that includes an optical carrier component and an optical sideband component obtained by modulation with a high-frequency signal whose frequency is predetermined;

means for extracting an original high-frequency signal from the transmitted optical signal;

means for combining the optical signal, a first optical local component from a local light source and a second optical local component from the local light source having a predetermined frequency differential from the first optical local component;

means for making a carrier frequency of the extracted original high-frequency signal coincide with the predetermined frequency differential; and

means for selecting two predetermined electrical components from plural electrical components obtained by an optical frequency mixing process.

8. An apparatus for transmitting high-frequency signals in an optical communication system, the apparatus comprising:

means for transmitting an optical signal that includes an

optical carrier component and an optical sideband component obtained by modulation with a high-frequency signal whose frequency is predetermined;

means for combining the optical signal, a first optical local component from a local light source and a second optical local component from the local light source having a predetermined frequency differential from the first optical local component;

means for selecting, as a first optical signal, lights containing the optical sideband component included in the optical signal and the first optical local component from the local light source;

means for selecting, as a second optical signal, lights containing the optical carrier component included in the optical signal and the second optical local component from the local light source; and

means for selecting a signal with a relatively low frequency after mixing the first and second optical signals.

9. An apparatus according to any one of claims 5 to 8, further comprising:

means for generating an optical carrier component with a single-mode light source that produces a single-mode optical carrier; and

means for generating an optical sideband component obtained by modulating the optical carrier component by a high-frequency signal by means of optical modulation.

10. An apparatus according to any one of claims 5 to 8, wherein the combining means has a configuration that projects plural light beams onto a photo-detector to be combined and extracts at least part

of combined optical signal as electrical signals.

11. An apparatus according to claim 10, wherein the photo-detector has a configuration of a balanced receiver.

12. An apparatus according to any one of claims 5 to 8, wherein the means for generating the first optical local component from the local light source and the second optical local component from the local light source having the predetermined frequency differential from the first local light uses a method for extracting two desired continuous waves from an optical spectrum emitted from a pulsed light source.

13. An apparatus according to any one of claims 5 to 8, wherein the means for generating the first optical local component from the local light source and the second optical local component from the local light source having the predetermined frequency differential from the first optical local component uses a method for extracting two desired continuous waves from an optical spectrum emitted from a pulsed light source with optical injection locking.

14. An apparatus according to any one of claims 5 to 8, wherein the means for generating the first optical local component from the local light source and the second optical local component from the local light source having the predetermined frequency differential from the first optical local component uses a method that utilizes a light source that emits two adjacent lightwaves.

15. An apparatus according to any one of claims 5 to 8, wherein the means for generating the first optical local component from the

local light source and the second optical local component from the local light source having the predetermined frequency differential from the first optical local component uses a method of selectively producing two light waves by modulating light from a single-mode light source.